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TM-(L)-793/003/00

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TECHNICAL MEMORANDUM

(TM Series)

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New 1604 Computer Programs
Milestone V
Input Tracking Data (STAPIN)

by

Nancy Speer
22 January 1963

Approved

B. G. Ciaccia

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22 January 1963

1

TM-(L)-793/003/00

1.0 SUBROUTINE IDENTIFICATION

- A. Title: Input-Tracking Data (STAPIN), Ident. H83, Mod AB.
- B. Programmed: 18 January 1963, Nancy Speer, G. Mahon, D. Persico, System Development Corporation.
- C. Documented: 18 January 1963, Nancy Speer, System Development Corporation.

2.0 FUNCTION

Tracking data will be introduced into the augmented 1604 program system in three ways:

- 1) the transfer tape used for transmission from augmented stations via the Bird Buffer Computers,
- 2) the paper tape in the transfer tape format used for transmission from semi-augmented stations via 100 wpm teletype lines, and
- 3) the paper tape used for transmission from unaugmented stations via 100 wpm teletype lines.

STAPIN is a closed subroutine that reads all tracking data, formats and stores them in the locations specified by the user program, and, if requested, provides a BCD listing of the data points for off-line printing.

STAPIN replaces the present PT subroutine (described by FN-6872) in the augmented SEA program system. The programs using STAPIN include SUP, SORBFIT, STONE, SCURVE, SCOMP, SLAP, SDOWN, and LFE Tracking.

3.0 USAGE

3.1 Internal Communication (with User Program)

3.1.1 Calling Sequence

α	RTJ	STAPIN
	AT	D ST
$\alpha+1$		(NP)
		(REV)

NP and REV are 24 bits each.
REV is scaled B5.

$\alpha + 2$	ZRO	T
	ZRO	AZ
$\alpha + 3$	ZRO	EL
	ZRO	R
$\alpha + 4$	ZRO	DOP/PF
	ZRO	SF
$\alpha + 5$	Error Return	
$\alpha + 6$	Normal Return	

where: AT = antenna type

i.e. 0 = none (used for doppler paper tape only)
1 = VERLORT (AN/FPS-16 or AN/SPQ-2) (MOD₂)
2 = TLM-18 or AGAVE
3 = ANGLE-TRACKER
4 = T/D (Telemetry and Data)
5 = PRELORT
6 = DOR (Disk-on-Rod)
7 = QUAD-HELIX

D = doppler data indication

i.e. 0 = read all data from AT
1 = read only doppler data from AT
2 = disregard doppler data from AT

ST = station number

NP = maximum number of points to be stored

REV = revolution number, scaled 2^5

T = starting address for system time storage buffer

AZ = starting address for azimuth storage buffer

EL = starting address for elevation storage buffer

R = starting address for range storage buffer

DOP/PF = starting address for doppler data, or primary frequency
if ship FMR doppler

SF = starting address for secondary frequency if ship FMR
doppler

If the BCD listing of data points is desired, enter STAPIN with the Accumulator set to zero. To suppress the listing, enter STAPIN with the Accumulator set to non-zero.

3.1.2 Format of Stored Data

The data stored in the buffer areas specified by the user program have the following configuration:

<u>CELL</u>	<u>CONFIGURATION</u>
System Time (T)	Seconds - fixed point, scaled 2^0
Azimuth (AZ)	Radians - floating point
Corrected Elevation (EL)	Radians - floating point
Range (R)	Feet - floating point, occupying 46 most significant bits (for MOD2 from a land station) or 47 bits (for all other data) bit 0 = weight 1 = lock-on 0 = no lock-on bit 1 = passive track (land MOD2 only) 1 = passive track (bad range quality) 0 = no passive track (good range quality) for angles only or angles and doppler, bit 0 will be used for weight and the rest of the cell will be clear.
Doppler/Primary Frequency (DOP/PF)	Doppler shift in cycles/second - floating point bit 0 = weight, if only doppler is stored
Secondary Frequency (SF) - Used only for ship PMR	Doppler shift in cycles/second - floating point, occupying 47 bits. bit 0 = weight of secondary

3.1.3 Indications Given Upon Return

1. Data Type: The following values in cell FORMAT of the RIPOOL indicate the type of data that was input:
 - 0 = angles and range
 - 1 = doppler only
 - 2 = angles only
 - 3 = angles and doppler
2. Error Return: The cause of the error return is indicated by the following accumulator settings:
 - 0 = insufficient data points (8 or less)
 - 1 = no data for requested station; rev, and/or vehicle number
 - 2 = no data from specified antenna

These settings are pertinent particularly when reading paper tape from unaugmented stations because the AT value in the calling sequence is ignored (unless the tape format cannot be determined from the tape header).

3.2 External Communication (with Operator)

3.2.1 On-Line Messages

The following messages will be written on the on-line typewriter:

1. REQUEST DATA FROM (station name) REV (number) VEH (number)
2. WRONG DATA
 - IF RECOVERABLE, PROVIDE INPUT (IF PRESTORED, SET Q NQ 0), HIT START
 - IF UNRECOVERABLE, SET ACC NQ 0, HIT START
3. NO HEADER
 - TO REREAD, SET ACC NQ 0, HIT START
 - TO CONTINUE, TYPE MONTH, DAY, AMPM AS MM/DD A(OR P)
4. 20 DATA POINTS LOST BY PARITY
 - TO REREAD, SET ACC NQ 0, HIT START
 - TO CONTINUE, HIT START
5. CANNOT FIND DATA
 - IF RECOVERABLE, PROVIDE INPUT (IF PRESTORED, SET Q NQ 0), HIT START
 - IF UNRECOVERABLE, SET ACC NQ 0, HIT START

3.2.2 Operator Response

The Operator will respond to these messages in the following manner:

1. Message 1 appears only when paper tape is to be read. The Operator will fulfill the request by loading the appropriate paper tape into the paper-tape reader with the read head in the blank space preceding the binary data, and hitting start; or, if the paper tape was prestored, by loading the magnetic tape onto tape unit 7, setting the Q register to non-zero, and hitting start.
2. Message 2 tells the Operator if the wrong paper tape was loaded (i.e., it was not of the requested station, revolution, or vehicle number). The Operator will either provide the requested data and follow the instructions given in line 2 of the message, or act according to line 3.
3. Message 3 indicates that either the paper-tape header had bad parity, was the wrong length, or could not be found.* If the Operator decides to re-read, he will re-insert the paper tape (if not prestored), set the accumulator $\neq 0$, and hit start. If he chooses to continue, he must input via the on-line typewriter month, day, and an AM or PM indicator as follows: two digits (01-12) for month followed by any symbol or space, two digits (01-31) for day, one space, and "A" for AM or "P" for PM.
4. Message 4 is written when 20 parity or message length errors are encountered when reading paper tape, prestored paper tape, or Transfer tape. If the Operator decides to re-read, he will set the Accumulator to non-zero (if paper tape, re-insert it into the paper-tape reader) and hit start. To continue he should just hit start.

* If the header could not be found on the magnetic tape containing prestored paper tape, Message 5 will be written instead of Message 3.

5. Message 5 means the desired header could not be found on the prestored tape. In this case, the Operator will respond as described in paragraph 2, above.

It should be noted that when using magnetic tape (prestored paper tape or Transfer tape), the Operator must not rewind the tape in response to any of the re-read options listed above. The required tape handling is done automatically.

4.0 DETAILED PROCESSES

4.1 Input Method

After setting the cells ST and REV in the Reference and Intercommunication Pool (RIPOOL) from the information given in the calling sequence, STAPIN determines whether the station is augmented, semi-augmented, or unaugmented by the indicators in the Station Configuration Indication (SCI) cell and Station Transmission Mode Indication (STMI) cell of the RIPOOL. On this basis, the subroutine prepares to read either the Bird Buffer Transfer Tape, paper tape in the Transfer tape format, or paper tape in the present format.

4.1.1 Paper Tape from Unaugmented Stations

STAPIN writes message 1 (see Section 3.2.1) on the on-line typewriter and halts. The Operator will load the requested paper tape into the paper-tape reader and push START, or, if the paper tape has been previously stored on a magnetic tape, he will mount the magnetic tape onto tape unit 7, set the Q-register to non-zero, and push START. STAPIN senses the Q-register and generates accordingly the calling sequence necessary for the subroutine SATPATT to perform the actual read, 40 frames at a time.

When the header is read, STAPIN checks the station designation to verify that the required data will be input. (Because revolution and vehicle numbers are not given in the header, these requirements are not checked). If the station does not correspond to the request, STAPIN types on-line message 2. If the error is corrected, STAPIN calls SATPATT to perform the read again and checks the header again. If the error is unrecoverable, STAPIN executes an

error return to the user program with the Accumulator set to 1. If no header was associated with the tape or a parity error was detected in the header, STAPIN writes message 3 via the on-line typewriter and waits for the Operator response. From the header information, the RIPOOL cells MONTH, DAY, FORMAT, and AMPM are set.

As the data are read in, STAPIN checks word length and parity. If either word length or parity is found to be in error, the data point (1 word) is rejected. Good data points are processed as described in Section 4.2 and bad data points are counted. When 20 bad data points are encountered, message 4 is type on-line. If the Operator specifies continuation, STAPIN completes the input process, but executes a normal return to the user program only if more than eight good data points have been processed. Otherwise, an error return with the Accumulator set to 0 is executed. If the Operator specifies re-read, STAPIN reads the tape as before, however ignores the header.

Formats for this type of paper tape are given in Appendix A.

4.1.2 Bird Buffer Transfer Tape

The SRDTRK subroutine is used to read the required tracking data one record at a time from the Bird Buffer Transfer tape. If no data meeting the station, revolution and vehicle requirements are found, an error return is executed with the Accumulator set to 1. When data from the required station and vehicle on the right revolution are found, STAPIN compares the antenna identifications in the header message with the antenna identification in the calling sequence. If the required data are not being input, STAPIN looks for a header indicating that the antenna selection changed during the pass. If no such header is found, STAPIN executes an error return to the user program with the Accumulator set to 2. When the requested data are found, the cells MONTH, DAY, and AMPM in the RIPOOL are set from the information given in the header message.

Each tracking data record is subjected to parity, checksum, and record length checks. As errors are encountered, STAPIN counts the number of records in error until 20 are counted then types out message 4 and waits for the

Operator's response. If the Operator specifies "continue", STAPIN resumes reading the remaining records; otherwise, the entire file is read again. All bad data points (those failing the checks listed above) are discarded and good data points are processed as described in Section 4.2. If no more than 8 good data points are processed, an error return with the Accumulator set to 0 is executed.

The Transfer tape format is given in Appendix B.

4.1.3 Paper Tape from Semi-Augmented Stations

This paper tape is read by SATPATT and subjected to the same parity and word length checks as paper tape from unaugmented stations. The header is interrogated in the same manner as the Transfer tape header. Processing of the data is described below. The format is given in Appendix C.

4.2 Data Processing

4.2.1 Angles and Range

When either VERLORT (AN/FPS16 or AN/SPQ-2) or PRELORT antenna is specified by the user program, STAPIN processes angles and range data. Azimuth and elevation are converted to floating-point radians, and elevation is corrected for refraction. If Doppler data are included in the message they are processed only if requested by D in the calling sequence (see Section 3.1.1). Upon exiting, STAPIN will inform the user program of the availability of the requested Doppler data by setting the Accumulator to 3.

4.2.2 Angles Only

When data from the TLM-18, T and D, DOR, Angle Tracker, Quad-Helix or Ship TLM-18 antennas are specified, STAPIN processes angles only. If transverse angle is included (T and D), the given azimuth, elevation, and transverse are converted to local azimuth and elevation by the following equations:

$$a = A + \tan^{-1} \left(\frac{\tan T}{\cos E} \right)$$

$$e = \sin^{-1} (\cos T \sin E)$$

where: A = input azimuth

E = input elevation

T = input transverse

Azimuth and elevation from Ship TLM-18 are corrected for roll, pitch, and heading in the following manner:

$$a = A + H - 2\pi\eta$$

where: A = input azimuth

H = ship heading

$\eta = 0$ if $A + H < 2\pi$

$= 1$ if $A + H \geq 2\pi$

$$e = E + \tan^{-1} [\cos (H-a) \tan (P-\pi/2) + \sin (H-a) \tan (R-\pi/2)] - 0.3926990817$$

where: E = input elevation

H = ship heading

P = ship pitch

R = ship roll

Elevation is corrected for refraction before it is stored. Doppler data from these antennas are handled as specified in Section 4.2.1.

4.2.3 Doppler Data

400 μ c doppler will be sent to the STA in two forms: (1) half cycles/second representing a two-way doppler shift plus 50kc, and (2) half microseconds representing the time required to count a given number of the aforementioned cycles/second. Given either form, STAPIN solves for the one-way doppler shift by the following formulae:

1. Cycles/Second Input

This value (f_r) can be expressed in cycles/second by:

$$f_r = \left[\frac{16}{15} f_{du} + f_{dd} + 50kc \right] nm$$

where: f_{du} = up-link doppler shift

$$f_{dd} = \text{down-link doppler shift} = \frac{16}{15} f_{du}$$

50kc = offset frequency

$n = 8(.9965)$ for unaugmented VTS and NHS

= 1 for ATS, SAS, augmented VTS and NHS

$m = 1$ for unaugmented VTS and NHS

= 2 for all other cases

Solving for f_{du} , we have:

$$f_{du} = \left[(f_r/nm - 50kc) \frac{15}{16} \right] / 2$$

2. Half Microsecond Input (STL and ship PMR)

This value (T_r) can be expressed in cycles/second by:

$$T_r = \frac{(2 \times 10^{-6}) n}{\frac{16}{15} f_{du} + f_{dd} + 50kc}$$

where: n = cycles counted

= 1024 for ship PMR

= 2048, 4096, or 8192 for STL

f_{du} is found by:

$$f_{du} = \left\{ \left[(2 \times 10^6) n / T_r - 50kc \right] \frac{15}{16} \right\} / 2$$

The resulting one-way doppler shift is stored in the specified buffer areas and output on tape 3 if a BCD listing was requested. When angle information is given in the track message with Doppler data, STAPIN processes these data in the manner described above and stores it in the specified areas if such action is indicated by D in the calling sequence.

4.3 Output Method

The data points are stored in the areas specified by the user program. RIPOOL cells NT and NR are set to the number of data points stored. If the Accumulator setting upon entrance to STAPIN indicated a BCD listing of data points, STAPIN outputs the listing on tape unit 3. The formats for the BCD listing are given in Appendix D.

5.0 RESTRICTIONS

5.1 Paper Tape Handling Procedure

When inserting paper tape into the reader, the read head must be placed before the binary data and following the listable and/or visual header. The same restriction applies when prestoring paper tape. Other restrictions pertaining to prestoring paper tape are as follows:

1. Each paper tape must be prestored 40 frames per record, beginning with the binary data.
2. Because the paper-tape input portion of STAPIN does not check vehicle number, the prestore magnetic tape must be vehicle specific.
3. Because the revolution number is not given in the tracking paper tape, it seems necessary that the tapes be prestored in ascending order of revolution -- if not all reports, at least those from the same station.

5.2 Input Limits

1. STAPIN will process accepted data points up to the maximum number specified by the user program.
2. All paper tapes must have a minimum of 10 stop codes (35₈).

5.3 Environment

1. Other subroutines used will include SRDTRK, SATPATT, TAPE, RC, SIN, ASIN, ATAN1, ARTYX, TAN, COS, OUTPUT OCTBCD, FLOAT, BCD OCT, OUTERR, and SUBERR.

22 January 1963

12

TM-(L)-793/003/00

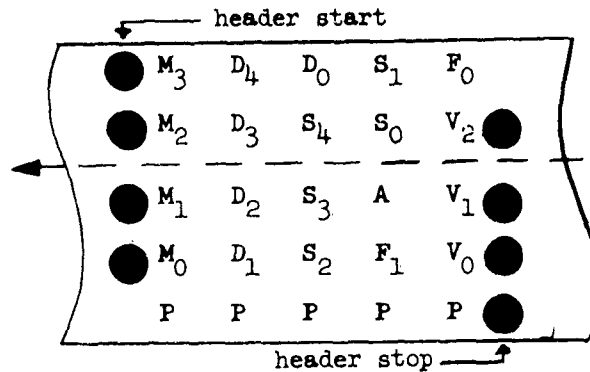
2. The RIPOOL cells, ST, MONTH, DAY, AMPM, REV, FORMAT, NT and NR will be set.
3. All index registers used will be restored to their original values before returning to the user program.

6.0 EQUIPMENT INTERFACE

The following equipments will be used by STAPIN and associated subroutines:

Bird Buffer Transfer Tape
tape unit 3
tape unit 7
paper-tape reader
typewriter

APPENDIX A

1. Header Format

where: P = parity (odd)

M₀-M₃ = month (01-12)

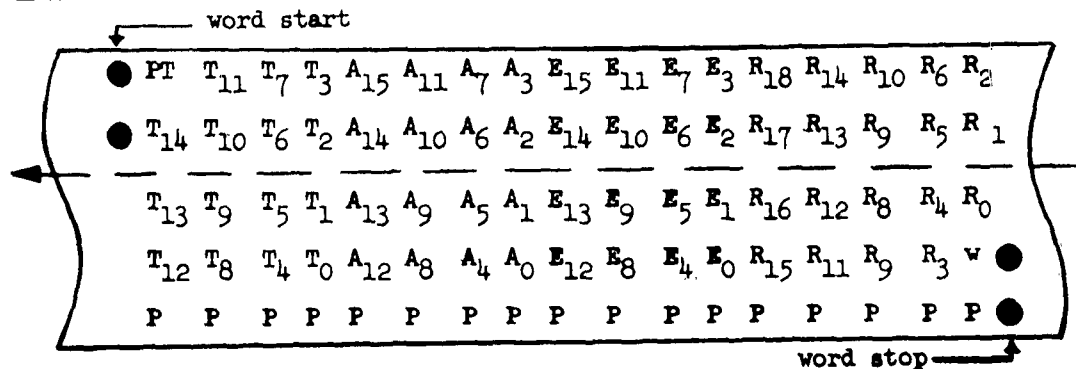
D₀-D₄ = Greenwich day (01-31)

S₀-S₄ = station number

A = AMPM: 0 = AM, 1 = PM

F₀-F₁ = format: 0 = MOD2, 1 = TLM-18, 2 = Doppler

V₀-V₂ = vehicle number (not used)

2. MOD2 (land station)

where: P = parity (odd)

PT - passive track indicator: 0 = active, 1 = passive

T₀-T₁₄ = system time (T₀ = 4 seconds)

22 January 1963

14

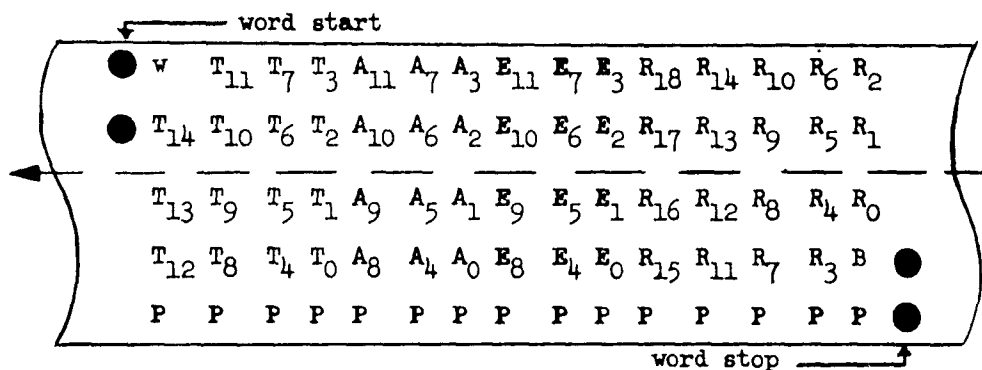
TM-(L)-793/003/00

$A_0 - A_{15}$ = azimuth (fractions of π ; - $A_{15} = \pi$)

$$E_0 - E_{15} = \text{elevation (fractions of } \pi - E_{15} = \pi)$$
$$R_0 - R_{18} = \text{range } (R_0 = 19.53125 \text{ yards})$$

W = weight: 1 = radar locked on, 0 = radar not locked on

3. MOD2 (Ship AN/SPQ-8)

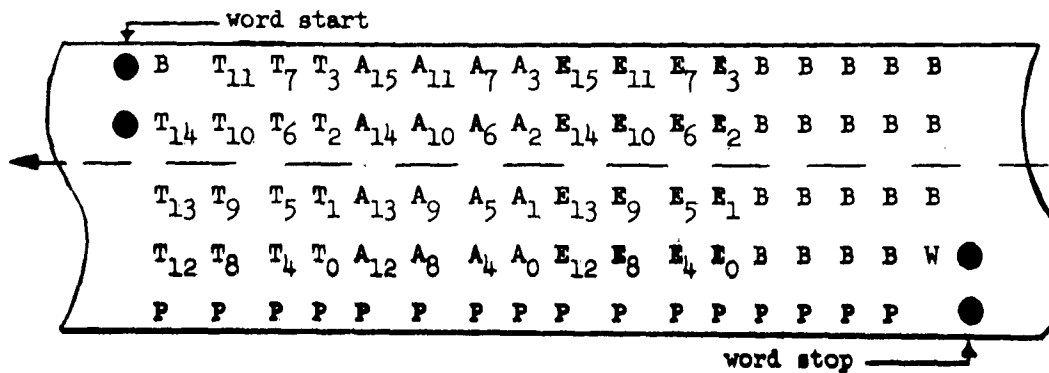


where: W = weight

$$T_0 - T_{14} = \text{system time } (T_0 = 4 \text{ seconds})$$
$$A_0 - A_{11} = \text{azimuth (fractions of } \pi - - A_{11} = \pi)$$
$$E_0 - E_{11} = \text{elevation (fractions of } \pi - E_{11} = \pi)$$
$$R_0 - R_{18} = \text{range } (R_0 = 9.765625 \text{ yards})$$

B = blank (no punch)

4. TLM-18 (land station)



22 January 1963

15

TM-(L)-793/003/00

where: P = parity (odd)

B = blank

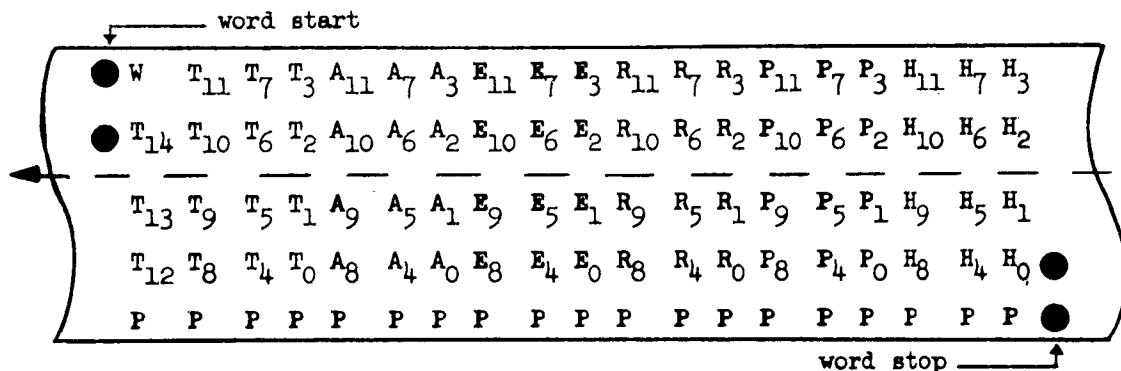
T_0 - T_{14} = system time (T_0 = 4 seconds)

A_0 - A_{15} = azimuth (fractions of π - $A_{15} = \pi$)

E_0 - E_{15} = elevation (fractions of π - $E_{15} = \pi$)

W = weight

5. TLM-18 (ship)



where: P = parity (odd)

W = weight

T_0 - T_{14} = system time (T_0 = 4 seconds)

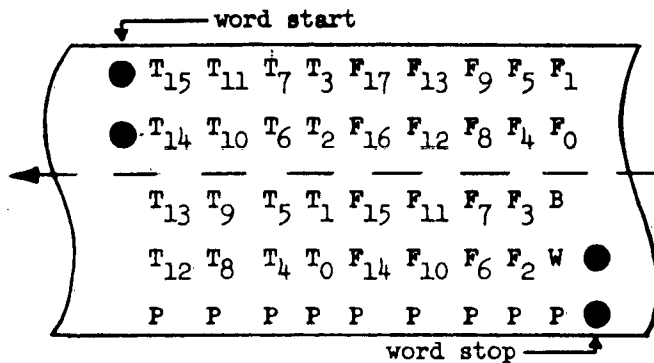
A_0 - A_{11} = azimuth (fractions of π - $A_{11} = \pi$)

E_0 - E_{11} = elevation (fractions of π - $E_{11} = \pi$)

R_0 - R_{11} = roll (fractions of π - $R_{11} = \pi$)

P_0 - P_{11} = pitch (fractions of π - $P_{11} = \pi$)

H_0 - H_{11} = heading (fractions of π - $H_{11} = \pi$)

6. Doppler (Lockheed Format)

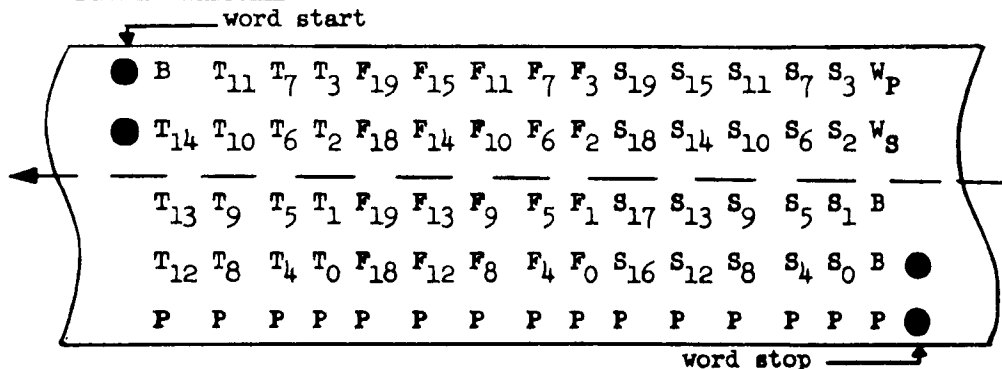
where: P = parity (odd)

T_0 - T_{15} = system time (T_0 = 4 seconds)

F_0 - F_{18} = frequency recorded (F_R), see Section 4.2.3.

W = weight

B = blank

7. Ship PMR Doppler

where: P = parity (odd)

B = blank

T_0 - T_{14} = system time (T_0 = 4 seconds)

F_0 - F_{19} = microseconds (Δt at 1024 cycles) for primary frequency

S_0 - S_{19} = microseconds (Δt at 1024 cycles) for secondary frequency

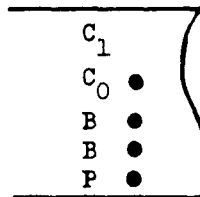
W_p = weight of primary

= 1 when primary frequency is being received

W_s = weight of secondary
 = 1 when secondary frequency is being received

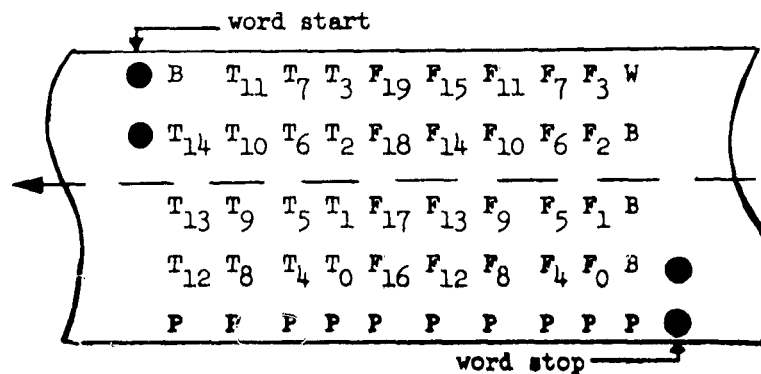
8. STL Doppler

A sixth frame is added to the paper tape header:



where: $C_0 - C_1$ = doppler count selected (2048, 4096, 8192)

The data word has the following format:



where: P = parity (odd)

$T_0 - T_{14}$ = system time (T_0 = 4 seconds)

$F_0 - F_{19}$ = microseconds (F_0 = $\frac{1}{2}$ microsecond)

W = weight

B = blank

APPENDIX B

1. Header Record

<u>WORD (12 bits)</u>	<u>DESCRIPTION</u>
1-10, 11 (upper)	6-bit BCD image - "BB-1604 TRANSFER DATA"
11 (lower) - 12	Vehicle number in 4-bit BCD
13	upper: station number lower: id. of first selected antenna
14	upper: reporting rate of first selected antenna lower: id. of second selected antenna
15	upper: reporting rate of second selected antenna lower: binary year minus 1960
16	upper: binary month lower: binary day
17-18	Revolution number in 4-bit BCD (999.9 maximum)
19	bit 2 ⁶ = AMPM bit: 0 = AM, 1 = PM
20-32	zero

2. Tracking Record

<u>WORD (12 bits)</u>	<u>DESCRIPTION</u>
1	7777 - common header
2	SN14 where SN = station number 14 = track message
3	14 NN where NN = number of words in message less one
4-5	system time
6	Antenna control and status information with the 6 most significant bits referencing antenna 1 and the 6 least significant bits referencing antenna 2. where: bit 11(5) = lock-on, antenna 1(2) 1 = lock-on 0 = no lock-on

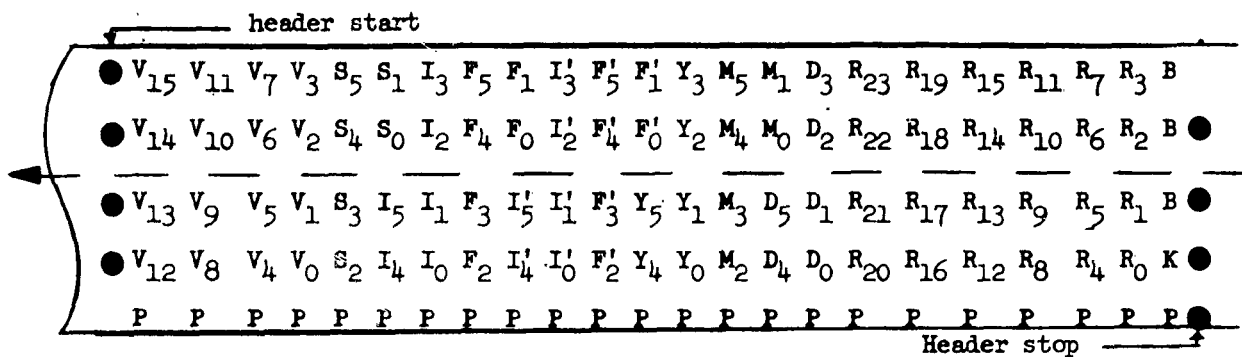
WORD (12 bits)DESCRIPTION

	bit 10(4) = transverse angle indicator, antenna 1(2) 1 = transverse given 0 = no transverse given
	bits 9-6(3-0) = antenna 1(2) ident
7-14	Report from antenna 1 where: Word 7, 8 = azimuth, fractions of 2π 9, 10 = elevation, fractions of 2π 11, 12 = transverse angle (in fractions of 2π), or range*, depending on antenna type, and/or 13, 14 = Doppler (F_R)
15-22	Report from antenna 2 (if none, Word 15 will be the checksum, and 16-23 will be blank).
23	Checksum if two antennas are reporting or, Blank, if only one is reporting.
24-26	Parity indicators
27-31	Blank
32	Checksum

*Range is given in units of 19.53125 yards for VERLORT, or 9.7656 yards for PRELORT.

APPENDIX C

1. Header Format



where: B = blank

P = parity (odd)

V₁₅-V₀ = vehicle number in 4-bit BCD

S₅-S₀ = station number

I₅-I₀ = identification of first selected antenna

F₅-F₀ = reporting rate for first antenna power of 2

I'₅-I'₀ = identification of second selected antenna

F'₅-F'₀ = reporting rate for second antenna power of 2

Y₅-Y₀ = current year minus 1960

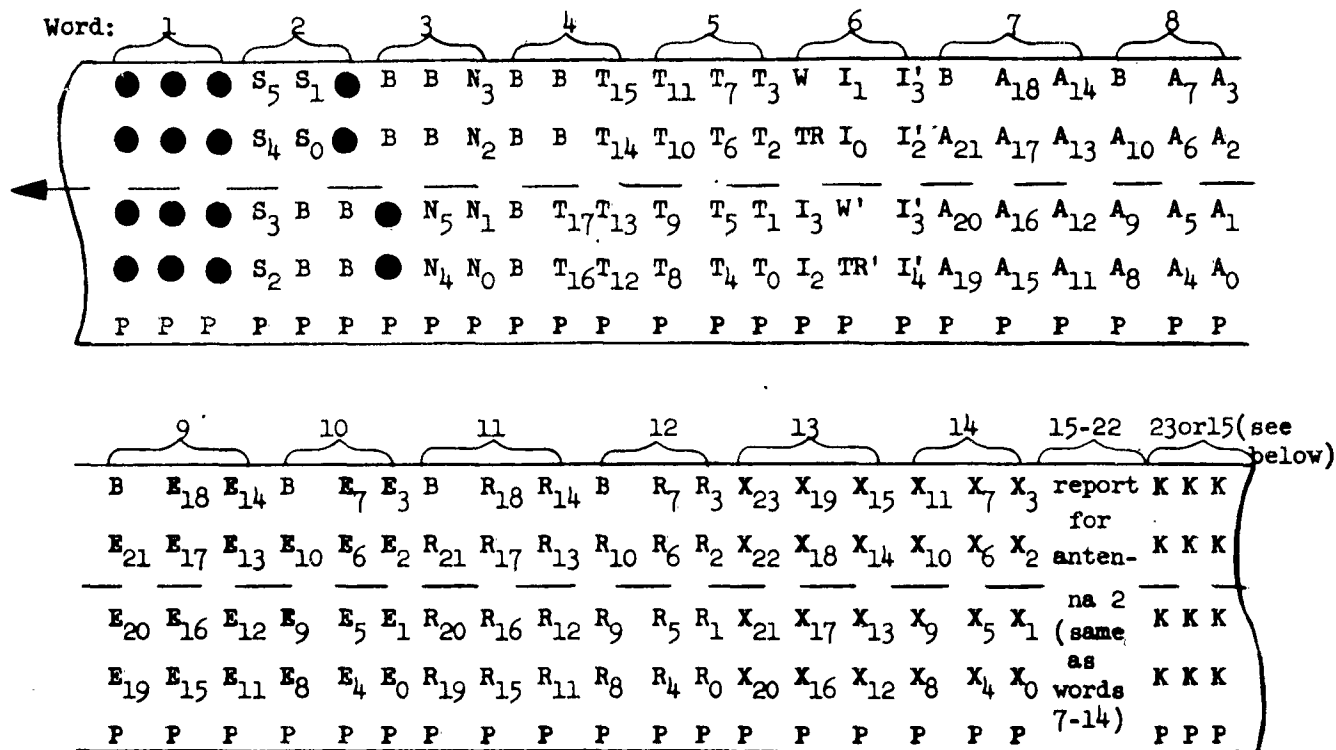
M₅-M₀ = binary month

D₅-D₀ = binary day

R₂₃-R₀ = revolution to a tenth in 4-bit BCD

= maximum of 999.9

K = AM/PM indicator; 0 = AM, 1 = PM

2. Tracking Message Format

where: B = blank

P = parity (odd)

First three frames (word 1) = 7777 = start of report

S₅-S₀ = station number

next 12 bits = 1414 = tracking report identification

N₅-N₀ = number of words in message minus 1 (3 frames = 1 word)T₁₇-T₀ = system time in seconds

W(W') = weight bit of first (second) antenna

TR(TR') = transverse angle indicator for first (second) antenna *

I₃-I₀(I'₃-I'₀) = identification of first (second) antennaA₂₁-A₀ = azimuth (fractions of 2π)E₂₁-E₀ = elevation (fractions of 2π)

* 1 = Transverse given, 0 = Transverse not given.

22 January 1963

22

TM-(L)-793/003/00

$R_{21}-R_0$ = transverse angle (fractions of 2π) or range where
 R_0 = 9.7656 yards for PRELORT and 19.53125 yards for
VERLORT

$X_{23}-X_0$ = Doppler data

K's = checksum

Word 15 = start of report for second antenna

= checksum if no second antenna reporting

This paper tape will have no less than 10 stop codes (35_8).

APPENDIX D

1. ALL DATA (EXCEPT SLIP FNR)									
(station name)	(date/antenna type)	(day)	(month)	(year)	VEH. NO. (xx)	RUN NO. (xx)	PAGE NO.		
SYSTEM FNR		UNIV. TIME	ALTDUTH ELEVATION+CORR.		RANGE	DOPPLER	RANGE ELEVATION	TRAN.	
SEC	HR MIN SEC	DEG.	DEG.	DEG.	KILOMETS	D/S		-S	
xxx	xx xx xx	xxx	xxx	xxx	xxx	xxxx			
.			
.			
.			
xxx	xx xx xx	xxx	xxx	xxx	xxx	xxxx			

2. SLIP (FNR) DOPPLER									
(slip code name)	DOP	(day)	(month)	(year)	VEH. NO. (xxx)	RUN NO. (xxx)	PAGE (xxx)		
SYSTEM FNR		UNIV. TIME	PRIM. FREQ.		WT. BIT	SEC. FREQ.	WT. BIT		
SET	HR MIN SEC	C/S	*=OFF	C/S	*=OFF				
xxx	xx xx xx	xxx		xxx					
.			
.			
.			
xxx	xx xx xx	xxx		xxx					

(xxx) POINTS									
xxx	xx xx xx	xxx		xxx					

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System Development Corporation,
Santa Monica, California
NEW 1604 COMPUTER PROGRAMS MILESTONE V
INPUT TRACKING DATA (STAPIN).
Scientific rept., TM(L)-793/003/00,
by N. Speer. 22 January 1963, 23p.
(Contract AF 19(628)-1648, Space
Systems Division Program, for Space
Systems Division, AFSC)

Unclassified report

DESCRIPTORS: Satellite Networks.
Programming (Computers).

States that STAPIN (Input Tracking
Data) is a closed subroutine that

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reads all tracking data, formats and
stores them in the locations specified
by the user program, and, if requested,
provides a BCD listing of the data
points for off-line printing. Also
states that STAPIN replaces the present
PT subroutine in the STA program
system.

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